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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

CONTENTS:

COBRA VENOM THERAPY IN THE NEUROSES 99
A. I. Jackman

PSYCHOBIOLOGICAL SYNDROMES—THEIR CORRELATIVE PSYCHODYNAMIC DETERMINANTS 103
Lewis J. Siegal

THE ELECTROENCEPHALOGRAM IN PARALYSIS AGITANS 114
Don L. Winfield and P. J. Sparer

THE PNEUMOENCEPHALOGRAM IN PATIENTS WITH A CONVULSIVE DISORDER 117
Israel H. Schuleman

ANALEPTIC ACTION OF ORAL METRAZOL IN GERIATRIC PRACTICE 121
J. R. Callan and W. L. Starnes

CARBON DIOXIDE THERAPY WITH STUTTERERS 123
R. G. S. Arthurs, D. Cappon, E. Douglass and B. Quarrington

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VOL. XV APRIL 1954 No. 4

Published monthly by
PHYSICIANS POSTGRADUATE PRESS
277 Broadway, New York 7, New York

EDITORIAL OFFICES
UNIVERSITY OF TEXAS SCHOOL OF MEDICINE
800 Avenue B., Galveston, Texas

Entered as second-class matter at the Post Office at New York, N. Y.

DISEASES of the NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Cobra Venom Therapy in the Neuroses

(A Preliminary Report)

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Chicago, Illinois

Cobra venom has been used since the early 1930's as an analgesic particularly in painful neoplastic conditions. However, it has been noted that many patients treated with cobra venom have not only been relieved of pain but have shown improvement in their mental outlook which could not be explained altogether by the drug's analgesic action.[1]

Experimental data adduced by Macht, Bryan and Propper-Graghtchenkoff,[2,3,4] tend to establish the fact that cobra venom abolishes pain through its localized action on some sub-cortical region. The hypothalamus seems, in the opinion of these authors, to be the seat of action. In contrast to such analgesics as morphine, codein and dilaudid, cobra venom has definitely been shown to stimulate the mental performance, is not habit forming, and what appears to be a cumulative action enables the therapist to decrease dosage and maintain the patient for long periods on the same constant dose.[5]

Cobra venom has been found harmless, even when administered in large doses, although some patients when given excessive quantities, such as 1800 m.u. in three days may develop transient diplopia and hemiplegia. However, as much as 50 m.u. twice a day may be given safely for an indefinite period according to Hills and Firor.[6] This is confirmed by a personal communication from Dr. W. S. Walsh, who has been treating a large number of cancer cases at Hines Veterans Hospital over a prolonged period of time. Many cases of painful arthritis have been treated for years with cobra venom with no side effects. Examinations of blood chemistry, as well as microscopic examination of kidney, liver, brain and pituitary tissue reveal no pathological changes.[4,6] In the experience of the author there are no electroencephalographic changes in the brain after periods of treatment lasting for one year.

It was first superficially confirmed by the author that many patients receiving cobra venom as an analgesic for painful neoplastic conditions showed marked improvement in their mental state aside from the decrease in the pain. This change would be normal when there is a decrease of pain but the increase of cheerfulness and decrease of anxiety impressed the author as being much greater than one would expect in cases of patients who knew they had incurable carcinomas.

In an endeavor to confirm this observation and in view of the fact that there is definite clinical proof that cobra venom is a safe therapeutic agent for humans if used properly, it was decided to use cobra venom on neurotic cases where the outstanding complaint was anxiety, in order to find out if it would benefit the neuroses. The cases selected were primarily those who had received every other form of treatment including psychoanalysis, electric shock, insulin coma or sub-coma treatment, carbon dioxide therapy, etc., either simply, consecutively or concomitantly, with little or no success. At first we used the commercial 10 m.u. per c.c. material

but later on we used preparations containing 50 m.u. per c.c. which became available as a result of purification of cobra venom due to the development of a method for removal of most of the hemorrhagic factors. An m.u. is that minimal quantity of cobra venom which will kill a 20 gram white mouse in 24 hours.

A control group of ten patients was set up. These received normal saline in the same volume quantities as the cobra venom treated patients. The plan was to give 30 daily injections to the control group, followed by an injection every other day, or three per week, for two months thereafter. The patients receiving cobra venom were placed on the same regime. However, in many of the latter cases treatment was prolonged beyond two months.

The first series of cases given cobra venom received one c.c. of 10 m.u. daily for 30 days, and then the same dose three times a week. Later 14 other cases were treated with the same protocol using 50 m.u. per c.c. daily in the beginning followed by the same dose three times a week. All cases treated with cobra venom preliminary to starting the regular treatment, were tested with graduated doses of cobra venom starting with ¼ c.c., then ½ c.c. and then the 1 c.c. dosage.

At all times it was sought to avoid any psychological therapeutic effect but the situation itself was suggestive and controls were necessary.

Results

Cases Treated With 10 M.U. Per C.C.

1. A 28 year old white male with anxiety reaction, having tension, anxiety, hyperhydrosis and tremor, nausea, anorexia, insomnia, nightmares, chronic, severe, showed marked improvement after 30 days treatment and maintained it for at least three months after therapy was terminated two and one-half months later.

2. A 30 year old white male with anxiety reaction evidenced by tension, anxiety, depression, insomnia and irritability, chronic, severe after three months treatment showed marked improvement which he maintained for at least another three months.

3. A 34 year old white male, with psychogenic gastrointestinal reaction manifested by anorexia, tension, morning emesis, chronic, severe had slight improvement with a decrease of emesis to about twice a week at the end of two and a half months of treatment and maintained the improvement up to four months after treatment ceased.

4. A 26 year old white male with anxiety reaction, manifested by tension, anxiety, insomnia, irritability, belching, pyrosis, chronic, severe improved moderately but the improvement was sustained for only one month after treatment was stopped.

5. A 38 year old white male with anxiety reaction, manifested by anxiety, tension, depression, irritability, insomnia, nightmares, tremor, chronic, severe after two months treatments showed only moderate improvement in all symptoms but this persisted for at least two months after treatment ceased.

Cases Treated With 50 M.U. Per C.C.

1. A 28 year old white male suffering since early childhood with anxiety reaction and obsessive trends, manifested by anxiety, tension, nightmares, nail biting, hyperhydrosis, fear of high places, anorexia, somnambulism, gastritis, inability to remain long at one job, urge to kill his mother, obsessed by dislike of the shape of his nose, mixed feelings of hate and fear of the Irish, chronic, severe was under treatment for six months before there was any improvement in his condition. The change was moderate but definite and has persisted over one year after treatment was stopped.

2. A 48 year old white female had been ill for over five years with anxiety reaction, with conversion symptoms showing anxiety, tension, spastic colitis, fear of being alone, dislike of mixing with others, guilt feelings over various sexual thoughts, pain in all her joints, depression, some hot flashes, chronic, severe. She was treated with cobra venom for four months and showed marked improvement in approximately two months in all the symptoms except the hot flashes. There was a recurrence of symptoms one month after treatment was stopped and treatment was again started. Patient then showed a marked improvement in three weeks which has persisted to date. The hot flashes were practically eliminated with estrogen therapy started after the other symptoms were under control.

3. A 25 year old white female with anxiety reaction with conversion symptoms, manifested for over six years by anxiety, tension, irritability, emotional instability and a feeling that her hands were paralyzed and that she was always about to fall, frequent crying spells, burning sensation all over the body, chronic, severe, had almost complete relief of symptoms in approximately 50 days of treatment. Treatment was continued an additional month and the improvement has persisted for four months.

4. A 23 year old white male had been ill for four years with anxiety reaction together with conversion and obsessive symptoms manifested by anxiety, tension, occipital headaches, dizziness, feeling of tremor in the back of the head coupled with a clicking sound, manual tremor, many irrational feelings with regard to the eyes, nose, throat, unable to socialize or go on with school, chronic, severe. Under treatment he showed marked improve-

ment at the end of 30 days and voluntarily informed the examiner that he noticed a greater ability to calculate and to think clearly. There was improvement in all symptoms except the dizziness which seemed to get worse to a slight degree. This patient had a blood pressure of around 90/76 previous to the development of his neurosis. At the start of treatment his blood pressure was 120/78 and at the end of treatment was down again to 90/74. Apparently the anxiety reaction had raised his blood pressure and the symptoms of dizziness which he had even before the neurosis, were somewhat improved by his neurosis. When the neurosis improved, his blood pressure slipped down due to the decreased anxiety and there was increase in dizziness. The author does not believe that the dizziness was essentially a neurotic symptom in his case but was due to hypotension. The patient returned to school and is doing fairly well although not completely recovered. After six months therapy he can be considered at least moderately improved. Electroencephalographic tracing showed absolutely no abnormality, nor did complete internal medical work-up. Lying down flat would relieve his dizziness.

5. A 25 year old white female had for four years suffered with anxiety and conversion reaction with artificial menopausal symptoms, manifested by anxiety, tension, irritability, depression, cephalgia, nausea, emesis, spastic colitis, inferiority feelings, insomnia anorexia, scattered aches and pains, loss of social and work life, hot flashes, chronic, severe. At the end of 30 days treatment there was considerable improvement in everything except her menopausal symptoms and it is the author's impression that she was about 50 per cent improved. Treatment was continued for an additional two months. At the end of the second 30 days of cobra venom treatment she was placed on estrogen therapy which improved her menopausal symptoms. The improvement due to the cobra venom has persisted for one year.

6. A 34 year old white female had been suffering for 10 years with anxiety reaction with conversion and asthenic symptoms manifested by anxiety, tension, fatigue, pressure feelings in the head, roaring in the ears, emotional instability with rapid pulse and many fears for her health, chronic, severe. Treatment was administered for a total of three months, and there was a moderate improvement at the end of the first thirty days. Improvement has persisted for one and a half years.

7. A 43 year old white male with anxiety and conversion reaction manifested by anxiety, tension, occipital tension headaches, stiff feeling in the neck, chronic, severe, had been ill for over three years. There was a marked improvement in this man's condition at the end of thirty days. Treatments were continued for an additional two months and the improvement persisted. However, the author has been unable to follow this case.

8. A 48 year old white male with anxiety and depression reaction, had for five years manifested anxiety, tension, agitation, fear of losing his mind, felt himself acutely inadequate for his social, financial and sex life demands, and suffered severe occipital tension headaches, insomnia, anorexia, chronic, severe. After three months of cobra venom therapy there was no improvement in his condition.

9. A 38 year old white male had been ill for ten years with anxiety and conversion reaction, manifested by anxiety, tension, fear of riding in autos, scattered aches and pains, especially in the left chest, irritability, argumentative, sick and tired feeling all the time, alternate diarrhea and constipation, chronic, severe. He improved markedly at the end of 30 days treatment, but when treatment was discontinued two months later the improvement was not maintained.

10. A 54 year old white female with anxiety reaction and involutional symptoms of two years' duration manifested by depression, agitation, anxiety, confusion, weakness, insomnia, inability to concentrate, fear of losing her mind, acutely asociable, tension, irritability, anorexia, chronic, severe demonstrated no improvement after three months of cobra venom therapy. She was later treated with a combination of estrogens and shock therapy and made a complete recovery.

11. A 30 year old white female with obsessive compulsive reaction had for eight years displayed marked fears of being alone, fear of people, anxiety, tension, guilt feeling, anorexia, insomnia, difficulty in sex relations with her husband, chronic, severe. Showed no improvement after three months cobra venom therapy.

12. A 38 year old white male had evidenced as long as he could remember anxiety reaction with psychosomatic symptoms manifested by anxiety, tension, manual tremor, stammering and stuttering, spastic colitis, chronic, severe. There was a considerable improvement after 30 days treatment in this man's spastic colitis and in his manual tremor as well as his anxiety. The stammering and stuttering did not decrease in any degree whatsoever. Treatment is being continued in this case at patient's request. Because of the marked improvement in his colon condition he is hopeful that it may have an effect upon his stammering and stuttering which is probably based on subconcsious anxiety.

13. A 32 year old white female with anxiety reaction manifested for two years by anxiety, tension and occipital tension headaches, chronic, severe. There was moderate cessation of anxiety, tension and headache at the end of 40 days treatment and the improvement has persisted for one year.

14. A 26 year old white male had been ill for four years with psychogenic gastrointestinal reaction manifested by spastic colitis, chronic, severe. There was a marked improvement at the end of 30 days treatment which is the first relief he has had in four years. Treatment is being continued.

Controls Using Normal Saline Injection

Ten patients with essentially the same type of conditions and findings as the patients described above, were treated, using the same protocol but

substituting a saline solution for cobra venom solution without their knowledge. Two cases showed mild improvement after such treatments. This improvement persisted for about a week and then was completely lost. Another one of the controls showed marked improvement at the end of 30 treatments and this improvement persisted for about three weeks then regressed to moderate improvement which has persisted. The improvement in these cases was obviously based on suggestion due to the therapeutic situation.

In each of the series of cases treated with cobra venom there was some infllammatory reaction when it was given subcutaneously. The old form of 10 m.u. per c.c. gave much worse reactions. Even given intramuscularly we had difficulty with it. The refined 50 m.u. per c.c. material only occasionally gave some pain and swelling if given subcutaneously. However, given intramuscularly in the upper outer quarter of the gluteal region we did not have any trouble. That is, in my opinion, the place of choice for injection.

This author believes that cobra venom has a definite effect on the brain in humans, as has been shown by previous references, as well as our own findings. However, the author has the impression, and wishes to formulate a hypothesis that the effective substance causing the improvement in patients who are neurotic, as well as the analgesic effect on those suffering from painful conditions, is due to the formation of some sort of anti-bodies. It takes as long as 20 to 30 days for relief of pain as well as decreased psychiatric symptomatology in patients. It is the author's impression that cobra venom produces anti-bodies which combine with receptors in the subcortical brain and which in turn block off pain and anxiety reactions, that may be transmitted through, or possibly are recreated in, the thalamic and/or hypothalamic areas, and thereby produce the clinical improvement. Of course, this is speculative and is based primarily on the fact that it takes considerable time to develop therapeutic effects, the time factor being consistent with that necessary to develop antibodies, and inconsistent with time factor for a drug acting specifically.

Conclusion

1. Cobra venom appears to be an effective therapeutic agent in some neurotic states and should be more thoroughly studied.

2. Cobra venom is a safe therapeutic agent if properly used and its effect appears to be prolonged.

3. The improved concentrated form of cobra venom is preferred for treatment as it gives less side reactions.

Acknowledgement: The cobra venom used in this study was generously supplied by Hynson, Westcott & Dunning, Inc., Baltimore, Md.

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Psychobiological Syndromes —
Their Correlative Psychodynamic Determinants

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The advancement of psychosomatic medicine presupposes an understanding of the basis upon which psychic influences may stimulate or create undeniable functional derangements and/or bring about definite physical organic structural changes.

Cases of disordered personality (as products of emotional dislocation with associated organic illness) are considered by the writer under the following criteria: (a) the patient's fundamental make-up, (b) the extent and duration of his emotional agitation, (c) the seriousness of his organic illness. These three basic elements I regard as inseparable, in order that etiology as well as the course of therapy be considered on a psychobiological foundation.

The competitive efforts of modern society and the constancy of disappointment resulting from man's need for recognition, as well as his search for security, do, in some, give rise to the peculiar and disordered reactions of defensiveness occasioned by defeats and unfulfilled basic psychobiological wants.

It is this succession of psychic struggles and defeats, when constant or enduring, that liberates psychic hyperactivity, and when overwhelming, gives way to, or is complicated by, psychobiological constellations.

In patients who attempt to handle their overloaded psychic strains without first obtaining sufficient release, the holding back frequently results in variously-located functional bodily derangements. As seen by the writer at hospital bedside, psychosomatic clinic, veterans installations, as well as in other and non-institutional settings, the most frequent disorders have included vertiginous bouts, backache, undue fatigue, sundry gastric and colonic disorders, dermatological manifestations, painful limbs, headache, bed wetting, migrainous attacks, asthmatic paroxysms, precordial distress, muscular twitchings, etc. Consideration of the latter condition with the writer's evaluation of its psychogenic and organic dyskinetic determinants may be found elsewhere.[1]

There is a definite difference between the conversion syndrome found in an hysterical personality and the symptomatology demonstrated by the patient with psychosomatic illness. The physical manifestation in hysteria acts as solution of the patient's conflicts, and as such symptom it is well received by him. Contrariwise, in psychosomatic illness the patient symptomatically reflects the physiological result of his overtaxed psychic strain for which no solution nor appropriate release has taken place. The hysterical symptoms hold down emotional strain, while psychosomatic symptoms are end-products of stored-up unreleased emotional tension.

In discussing the subjoined representative but by no means all-inclusive types of pathophysiological syndromes seen by the writer, development and utilization of their dynamic factors shall be emphasized and consideration given to analysis of their constituent features and determinants of their clinical approach.

As cardinal etiological factors, I have found that emotional upsets predicated upon marked disappointments, long-standing unresolved conflicts, and pent-up concealed aggressiveness, are largely responsible for certain cardiophobic or other subjective cardiopathic manifestations.

I have noted that these patients' symptomatic complaints are largely referable to the precordium, with description of discomforts resembling cardiac arrhythmias, or shows of panic and terror attending rapid heart action. Upon clinical examination in cases where I have found no evidence of existing organic cardiac pathology, it becomes apparent in the absence of structural cardiopathy, coupled with the development of adequate psychiatric history which latter I

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Based upon an address delivered before the Psychiatric Conference, Lebanon Hospital, January 24th, 1953.

predicate upon the three basic criteria to which I have referred—that the disturbance reflects an interaction and interdependence of psychic and somatic phenomena. Here, I endeavor therapeutically to point out to the patient his pre-occupation with his heart consciousness, and indicate, wherever it appears, any possible identification with others (whether in the family constellation or within his outer environment) who may have been victims of heart disease. In addition, existing unresolved conflicts, disappointments, and stored-up hostilities are afforded adequate ventilation to establish thereby the patient's insight into the consciousness of the dynamics of his behavior, thus responsible for his presenting psychophysical situation. Lastly, though as fully important, the causality of his psychogenic stress is afforded systematic release with a view to therapeutic elimination of implicated offending factors.[2,3,4,5]

To illustrate a case in point, where the disorder had been predicated or notably influenced by the patient's emotional state, I am mindful of a well built white male in his early fifties who was referred to the psychosomatic clinic because of his terror of 'heart disease.' As a culmination of manifold elements, J.S., in desperation and as a last straw presented himself for psychiatric help. Clinically, the patient demonstrated no evidence of cardiac pathology. His complaints ranged from generalized bodily shakiness, to outbreaks of inordinate sweating, stammering, fear of associating with anyone, and fear of taking on any sort of employment. He lived in his own seclusiveness, with dread to walk out of doors lest his heart suddenly give out. He was in mortal terror of cerebro-vascular accident, showed and verbalized fear of hypertension and demonstrated general symptom panic. He showed distrust and suspicion of people's motives, with collateral marked self-depreciation and self-reproach for the defectiveness of his past accomplishments. Yet, at the same time, he did not fail to blame others for his troubles. He gave voice to his early problems concerning parental authority toward him—its description in reality being significant of his unconscious confession of his own infantile situations. With his exhibited generalized tremulousness coupled with demonstrations of weeping, he otherwise fulfilled the picture of total emotional de-control.

He had been a physician's chauffeur for many years, and during his waiting periods between his employer's medical visits, our patient treated himself to self-assigned medical readings from the employer's tomes on the subjects of heart disease, hardening of the arteries, apoplectic deaths and similar pathological morsels. As he had had ample opportunity for rumination, the patient's vicariously acquired educational accomplishments resulted in his identification with sundry conditions of ill-health and to cap the climax of association in feeling, the patient's employer had cardiac disease and was a consistent drinker. Long ago our patient had taken to alcohol to 'quiet the nerves,' and for some two years preceding therapy at my clinic he had done no work and had sought none. He did however occupy himself with visits to doctor's offices, and for his multitudinous ailments he consumed all the manufactured sedative medication he could purchase, plus the full gamut of vitamin therapy. When I first saw him, he had vials of diversified tablets in every pocket.

Therapeutically, I indicated to the patient his engrossment in his heart, and made systematic inquiries as to whether others in the family group or outside of it, suffered from cardiac disease. His unexplained defeats, frustrations, expectations and accumulated antagonisms were exposed to free discussion, and an effort was made to assist the patient to a clear recognition of the driving forces within him, accountable for his existing psychophysical syndrome. With the same vigor, the significance of his stressful situation was subjected to thorough expression and directed toward elimination of the manifestly responsible damaging influences. Therapeutic activity was further aimed at affording him opportunity to disgorge his strongly repressed hatreds. His guilt and regrets were gone into, and opportunity as well as encouragement of abreaction of his feelings during the therapy sessions were freely made available to him. He received intensive guidance toward an understanding of the weakness of his own personality, toward recognition of the sources of his difficulties and toward realization of the operation of his emotional drives and their productive factors as they had influenced or shaped his human relationships with others. His defenses, vague fears and other concurrent symptoms inclusive of his anxiety pattern were unfolded to him, in an endeavor to assist him to evaluate them understandingly. The significance of his special problems were also made apparent to him to the end that he secure helpful insight for his behavior as well as a realization of its contribution to his conflictual situations. During the course of therapy it was apparent that despite his average intelligence, his abstract reasoning was faulty, manifestly on the basis of his deficient emotional control; and because of the latter and its concomitant demonstrations of aggressive and subduedly hostile behavior, he maintained very guarded contact of any sort with anyone.

His drinking appeared to have stemmed initially from the element of frustration, resentment, search for recognition, and unattained security, the distress whereof he diluted by his persistent use of alcohol. It is upon the latter that the patient had learned, over the years, to lean heavily for physical dependence; and although he tried to find what he lacked, through the use of drink, he thereby actually

maintained rather than escaped his conflictful existence.

Eventually, his response to therapy became expressed in greatly diminished anxiety, in lessening of panic respecting street travel, in apparent gradual understanding of his physiological disturbances of function and their correlation to his psychic conflicts—hindrance to the discharge of which, had been heretofore expressed in his emotional and somatic deviations. He began to show increased general interest in, as well as a recognition toward better control of, his impulsiveness. He next discarded all his drug-taking and, if I was to believe the patient, he reduced and finally discontinued whiskey drinking entirely. Another and enterprising subsequent attainment, was the patient's search for, and actual procurement of outdoor employment. Of the latter I was convinced, because the patient pridefully brought in currently-dated employee's pay slips to attest to his employment and to his earning ability. While the patient felt that he now became capable of modest productive work, he verbalized his own encouragement with an expressed future aspiration toward a more lucrative subsequent occupation after becoming better accustomed to his interpersonal relationships within the work-a-day world. He began to visit socially and to accept friends. His marital life with his spouse who had heretofore threatened to leave him (and upon whom he was helplessly dependent), which situation he had originally depicted as precarious, he now described as serene and companionable.

In the patient's own expression, "I have found life is worth living, not fearing." The newly-found tranquillity of his home life was later unsolicitedly affirmed by his spouse on an occasion when she called over the hospital telephone to report to me her husband's laryngitis on a day he was scheduled for one of his therapeutic sessions.

To this point it should be stated that the patient showed what may be termed a good therapeutic improvement, with adjustment to a social and industrial participation, a gradual liberation from the further destructive action of alcohol, with establishment of other and replaced wholesome interests.

Because of the superimposed factors of chronic alcoholism, the uniqueness of this case forbade any short cuts in continuing therapy and required well timed and consistent treatment. This was required not alone on the basis of the psychological and psychobiological factors reflected in the patient's constant awareness of precordial distress and fear of fatal outcome, but impelled, in addition, a dynamic study on the basis of his personality difficulties productive of his dependence upon alcohol.

Clinically, digestive organ symptomatology and pathology bear a definite association to emotional disequilibrium. I have found with considerable frequency that patients suffering from gastric or duodenal conditions unfold a history of neurosis with bouts of digestive upsets, pyrosis, gastralgia, and the eventual establishment of symptom chronicity. They invariably reveal instances of well recognized exposure to sundry disturbing circumstances. To recount but a few impelling situations: they reflect fear of social ostracism, present experience of unsolvable domestic upheavals, harbor feelings of guilt for past acts, are poorly adjusted to their industrial economy, show dread of a precarious and insecure future, etc. At times I have had them recount experienced phases of symptom amelioration, which, on careful psychiatric interview, would disclose a synchronization with periods of diminished tension when conflictful problems would become less acute. At other times I have had these same patients equally describe a worsening of their physical symptoms—indication of synchrony with emotional circumstances when and if full bloom conflict situations would reappear.

Physiologically it should no longer be open to question that when repeatedly subjected to malfunction, with resultant chemical and dynamic interference, the smooth gastric musculature becomes attacked eventually by the definite lesion of ulcer; and that the latter, when fully developed, produces the procession of symptoms of post-prandial pain with inconstant hematemesis, tarry stools and weight loss.

While treatment of diagnostically established gastric ulcer or associated disorders under strict medical regimen is of pre-eminent importance, the mechanics thereof obviously need not be outlined here. From the psychophysical standpoint however, the therapeutic approach that I have found invaluable, has been to reach out for the root of the patient's conflictful situation, to indicate the sources of his difficulties by planned attention to hidden overdependencies, unrequited strivings, pent-up hostilities, fear of competition—all to orient him in the valuation of his psychic components and their relationship to his physical damage. It is through such understanding that the patient may be guided toward attaining a feeling of 'belonging' both industrially and in his

social sphere, as well as to fortification of his efforts toward acquirement of his own self-respect, security in his personal life, and amelioration of his physical distress.[2,6,7]

I have noted that patients with demonstrable breathing difficulties, express a feeling of impending suffocation which is, more times than not, accompanied by productive coughing and loud wheezing. I have been struck by the unanticipated subsidence of these symptoms which appear to completely vanish; and as to the latter intervals, these patients, whether seen at the hospital bedside, clinic, or during office session, describe no discomfort and none is apparent.

From my observations of these cases, I have come to consider that in practically half of those with beginning asthmatic symptomatology, emotional upheavals carry the weight of etiological responsibility; and on careful psychiatric evaluation a considerable segment of patients with ful blown asthmatic syndromes demonstrate psychic ingredients associated with their bronchial illness. In the latter, the contact complications of the allergies or infections always receive prior clinical examination to establish or disprove clinical evidence of infection or allergy. From the standpoint of psychobiologic dysfunction, when present, I have come to note that the characteristic antecedent history usually brings out the full constellation of recognized neurotic symptomatology. Of the latter, I have recognized that the anxiety states are outstanding; with threats of insecurity, humiliation, fear of rejection, frustrating dependence, resentfulness, and turbulent home settings, numbering among the major disturbing precipitants which run the gamut of the etiologic picture.

I have seen patients in the throes of terror of smothering and have found this panic symptom to predominate particularly in the younger age group where the proximity of parental care is still of prime necessity. It is such panic-producing mechanism that serves to gain the parental protection craved for.

The basic elements of psychiatric approach to treatment within this psychobiologic grouping revolve about demonstrations to the patient of constructive understanding of his environmental home surroundings, coupled with steps taken to ameliorate his psychosocial threats to his security. With younger patients, I have found experientially that participation by, for the re-education of, the parents is of inestimable therapeutic importance. Counseling given as well as information gained, and in turn carried out by the parents of youthful patients respecting the latter's alarm, terror, rebuff, or parental estrangement, is of great usefulness toward effecting improvement in patients thus paroxysmally subjected. As far as is feasible, a constituent part of the corrective measures includes implementation to minimize environmentally-produced trauma; and chaotic home settings where adverse surrounding factors exist, merit attention with isolation of presenting problems, as well as interpretation to the patient of the relationship between the asthmatic paroxysms and the psychic conflicts which engender them.[2,8,9]

As the lungs and bronchi are innervated by a dual supply of pulmonary plexuses formed mainly by branches from the sympathetic autonomic and vagal autonomic systems, allergens as well as psychic stimuli, may, in susceptible individuals, provoke bronchospasm on the basis of psychobiologic mechanisms. Patients with personalities susceptible to these emotional tension states, are thus easy prey to asthmatic paroxysms which, when the tensions are not controlled, become inordinately recurrent and result in permanent anatomical impairment.

A moderately overweight 26 year old female was seen in the Psychosomatic Clinic. She was happily married and the mother of a one year old infant. The patient had suffered from chronic bronchial asthma since the age of three, with long history of exacerbations and remissions. Earlier she had received considerable physiological treatment in various settings over the years and had been hospitalized whenever her respiratory difficulties became overwhelming.

She had a very possessive mother, who in addition to being an overbearing disciplinarian, was decidedly overprotective. The patient, her husband and infant child, continued to reside at the home of her mother at the mother's insistence, and despite the patient's protestations, to say nothing of the discomfort endured by the husband.

The patient's parents had quarreled incessantly which is significant of what follows. When the patient was 3 years old, the father left home and never returned. Our patient endured untold eco-

nomic privation during her tender years and began to suffer from labored breathing which frequently bordered on suffocation, at the age of three. As already noted, she required hospitalization on many occasions when the attacks fulminated.

As the patient grew into her teens, she managed to come in contact with her father at various times. She related to me that during such meetings she always deluded herself with the idea that she was wanted; and noted that when seeing hr father her breathing would become easier. She described the father as an individual who made no effort to show her even a modicum of parental warmth or affection, nor did he display the slightest degree of interest respecting her social or economic situation.

Her mother continued her nagging and domination to such an intolerable degree that the patient together with her husband and child, had to move to their own home in order to escape the tormenting environment. This took place while the patient was in psychotherapy at our psychosomatic clinic.

During subsequent therapy, our patient showed the emotional effect of having "abandoned" her mother and demonstrated the anguish of finding herself between Scylla and Charybdis.

Shortly thereafter and following the change of residence, the patient showed a marked increase in, and constancy of oppressive wheezing. The noisy labored respiration could be heard as soon as she entered the treatment room, and gave the indication of impending suffocation.

The remissions, in varying degree, noted previously at different therapeutic sessions were no longer in evidence, and the patient reflected a feeling of complete helplessness. This was manifestly born of a disappointing situation which had saddled her with undependable parents and a feeling of being unwanted and unloved. She reacted with unconscious contempt for her parents, and her situation, as a serious threat to her existence, represented the culmination of her emotional unrepressed complex of alarm, helplessness, contempt and culpability.

Her visits to psychotherapeutic sessions had been punctual up to this point. One day I received word that she was severely ill and had to be taken to the hospital. A short time thereafter her husband asked to see me, and in an extreme demonstration of devotion, pleaded that I convey to him what words his wife had disclosed during her final therapeutic session. I learned from him that when taken to the hospital she was in extremis and that she had died in status asthmaticus soon after.

J.G., a 13 year old white girl, referred by school authorities, had been suffering from a dermatological condition since she was three. Her lesions (which had been variously diagnosed by physicians and clinics over the years) covered both antecubital areas, extensor and flexor surfaces of both wrists, as well as the palmar and dorsal areas of both hands inclusive of the fingers.

When I first saw her, the parts I have enumerated had an ichthyotic, excoriated and raw-flesh appearance, there was hidebound induration, and papular and vesicular eruptions were everywhere. Patient was tortured by constant itching, and she scratched herself continuously during the first month of therapeutic sessions.

Patient, born in 1939, was the product of a mixed marriage both from the standpoint of religions, as well as country of origin. Her parents were divorced in 1942 and the girl lived with her maternal grandmother, who was also separated from her husband since the patient was about seven years old. It is in this household and under these circumstances, where neither the child's parents nor her grandparents had been able to adjust their marital lives—that the child was being reared. As the mother had been obliged to work, the only adult member at home had been the aged grandmother.

The child demonstrated considerable emotional dejection and a deep concern in respect of her disfiguring and intolerable skin condition. She described how she felt different from other children when they would speak about their fathers, and indicated that she felt cheated because she was not in a like position to discuss her filial relationships as her other schoolmates would.

She spoke in timid strained voice, and after being reassured that she is no longer alone, and that she is talking to someone who is here to support her in her anxiety, she unburdened herself. She narrated her longing to be taken out by her father and characterized his almost total indifference to her when she would see her at infrequent intervals. She felt rejected, insecure, and believed that she was neither loved nor wanted and that her father was neither interested in her scholastic and social aspirations nor in her physical well being.

After several interviews, at my instance and invitation, the child came to therapy with her father. The latter met the situation with a rather ungracious and distrustful attitude and expressed his disbelief as to the efficacy of psychiatric treatment of this long-standing troublesome skin condition. This, he felt was the province of dermatology and required treatment by salves, lotions and perhaps assistance of peroral medication.

The patient's unwholesome environmental situations were gone into, and the manifold effects of parental separation were pointed out to the father. Demonstrating some modicum of perceptivity he reluctantly suggested that perhaps his child *did* sorely lack parent-child relationships and that she was love starved. With it he embraced her and wiped away her tears.

At the next session patient's mother stated in these words: "She mopes much less than she used to, and now goes out with her friends." Patient herself produced the following: "I feel happy because I went out with my friends and now I feel an interest in going out, and also invite them to my house. I came here prepared with facial tissues but I don't cry any more and don't have to use them. I used to scratch my hands and they used to bleed. My hands are improved now and I don't

have to have them covered with gloves. I always used to be ashamed to show them, and now I don't have to explain to anyone why my hands used to bleed." She showed improvement in her tension state, and commented that she looked forward to coming for treatment. She remarked: "Daddy was wrong when he thought salves alone can cure eczema. I see my skin is getting better because when my mind is clearer and I am occupied with friends, and have things to do, I don't scratch. I used to have nothing to do, had no friends to go out with and I used not to care to do anything. Now I am going to take up music. Before I came here I did not care to make friends. Only my mother mattered to me and I felt sorry for myself. Other kids have fathers and I thought I would never fit in with them. When they ask me about my father and mother now, I tell them they are divorced—it's natural. Before I used to feel like an outcast, now I never think about it any more. It's just as if I had a problem on my mind and the problem is solved. I used to think about the future and how I would be old with worry. I used to be afraid that I would be different from people, that I would have no friends and that people wouldn't want to bother with me because my mother and father are apart.

"Thinking of my father is a thing of the past and it never dawns on me to think of him. I used to imagine I was an outsider to all children and I used to say to my mother: 'Why couldn't you have married someone else? Why can't you make up so I can have a father?' I used to go around with a feeling that she did the wrong thing and I couldn't explain to her how resentful I used to feel. I never used to show it but I certainly felt it. I always used to wake my mother up, and bother and nag her when we used to go to bed, to answer my questions about her separation from my father. It was at night that I used to get irritated and mad at everything and I would begin to scratch my hands and they would bleed. When I would get up in the mornings I used to have ripped up hands, and I used to feel that I got what I deserved for nagging and bothering my mother so much and not letting her sleep."

The patient was encouraged to ventilate freely, and the relationship between her physical problems and emotional conflicts were thus approached. It progressively became apparent to our patient that her skin disorder had served as a punishment for the hatred harbored against her mother, and was a self-imposed and self-mutilating expression inflicted upon her skin, unconsciously motivated as an otherwise inexpressible hostility toward her mother and her existing environment. It was a self-punishment for the sense of guilt which her hostility had engendered, as well as for the secondary gain obtained by way of attention and sympathy.

The patient's weeping, with fear and anger, was expressive of her frustration in respect of competitive attitudes which had remained repressed and suppressed in her since her early childhood. Her overt as well as her inhibited weeping was equally expressive of her desire to overcome the separation from the loved object—which was her father; and the itching and scratching were manifestations of anger at the mother figure. Because of her guilt and fear, this anger was handled masochistically, and expressed itself in self-destructive assaults upon her skin, by unabated scratching. The scratching and itching developed into the vicious circle which had become engrafted upon a hostility which the patient could not turn outward, and which in consequence, became turned inward upon the self.

Objectively, our patient presented shyness and timidity and tended to handle her feelings by suppression, defending herself with all her powers, yet at the same time she showed obliging obedience. Beneath this there existed a layer of depressive thought and a marked, close-to-the-surface, emotional hyperactivity, with eagerness to react, and tendency to be over-critical.

I have tried to show that the relationship between skin disturbances and tension is close, and that an investigation of a patient's background will frequently fixate disorders founded or enhanced upon psychological factors.

Where physical dysfunctions reflect projections of psychic factors, the goal in our therapeutic effort should be the patient's acquirement of understanding of the meaning of his symptoms and the provocative nature of his conflicts, to the end that he develop such sufficiency of emotional elaboration as will gain for him amelioration if not abolition of his bodily disorders.

I have repeatedly observed that the chain of symptoms in migrainous attacks is frequently presented by patients in whom is most often detectable some recognizable hereditary neurotic factor. No satisfactory organic basis for this syndromic picture appears, and noteworthy is prodromal malaise usually ushered in with symptoms of air hunger; and not uncommonly variable gastric symptoms add to the complicating picture. The headaches are complained of as being one-sided (sometimes one side and sometimes the other), preceded by visual disturbances or altered sensory perceptions such as tingling of the hands, lips or tongue, irritability, forgetfulness, weakness and inability to carry on. In a number of instances I have personally recorded an initial blood pressure rise ranging to approximately 20 mm. of mercury systolic pressure, with a return to the previous level as the headache

subsides. I have observed a greater prevalence of the condition among female patients, with indications of continuous and/or severe tension states relating themselves to these attacks. I have also seen frequent manifestations of this syndrome in overworked studious patients and others whose efforts to better their condition far outstrip their innate physical and mental capabilities. In these patients I have often recognized a striking intolerance of error in themselves and others with whom they come in contact, with goals unusually high, and concomitant sexual maladjustments as frequent accompaniments. As chronic worriers, they make 'mountains out of molehills,' and even minor failures reflect a frustration which affects them out of all reasonable proportions. A typical attack disables them during its occurrence, and headache may endure until terminated by sleep. In many instances, I have found patients who continue to complain of persistence of headache even on the following day. The mechanism of the pain is in the main the result of pathological distention of the cranial arteries. In the words of Alvarez the condition may be said to typify a "vascular brain storm" associated with inharmonious physical or social agitation.

Etiologically, varying theories continue to be advanced from time to time, as to the causal factor of this troublesome syndrome. Among the propositions propounded are the presence of epilepsy either coexisting in the patient or traceable to his family, allergic disturbances have been proposed by some, while endocrinologic dysfunction has also been spoken of by others as the offending precipitant.

Once psychosomatically established, the therapeutic approach aimed at is to reach the sources of the patient's problems by guidance toward a recognition of his own personality make-up and by assistance toward the kind of insight which will help him to understand the nature of his somatic difficulties and the extent to which his emotional pattern has contributed thereto. Although mindful of restatement, it warrants emphasis that the ruling out of the existence of any and all physical factors or disabilities in the patient, is of fundamental importance, and a recitation of them is clearly redundant in this study.[2,11,12] For like reason no account is included here respecting choice of physiological medication. It should be emphasized however, that numerous pharmaceuticals are constantly being employed perorally as well as by the parenteral route. Each has its place in the physiological armamentarium and their pharmacodynamics may be consulted at appropriate sources.

Patients with symptoms of irritability of the colon and associated disorders, usually complain of being inordinately tired, or show preoccupation with their ease of fatiguability on the slightest exertion. They may be subject to bouts of watery diarrhoea, comingled with bowel casts and at times containing partially formed stools as well. The condition is frequently described by the sufferer as being preceded by or associated with such gastric complaints as pyrosis, eructations, post prandial pains or similar digestive discomforts. With some exceptions, I have found that these people exhibit anxiety-laden, irritable, or other emotional dysfunctions, and that they frequently carry over physical pathology referable to almost any bodily organ, for which, in many instances, their physical conditions had already received the indicated surgical and physiological medical attention at other sources.

In these conditions, although I find it difficult to postulate here why the patient's psychic reactions should have found particular expression in disturbed colon physiology, it becomes nevertheless clear that this somatic expression is the result of consciously suppressed or unconsciously repressed mental distress or the uneasiness caused thereby, and as such has become routed into this bodily organ dysfunction. Methodical psychiatric inquiry into the patient's personality also brings to light with great frequency that despite his unawareness of conscious emotional discomfort, the patient's mental conflicts have been in existence and as such, have become symbolized through this form of bodily disorder. From these significant phenomena it becomes logical to consider that the patient's character make-up, his environmental determinants and direct emotional strain, together with

the character and intensity of its suppression, its inevitable stress upon the normal function of the bodily organism, excessive muscular tautness, overtaxed autonomic system and overworked glands of internal secretion—all taken together, are responsible for the production of functional derangement wherever it exists and as such is presented as associated organ pathology. In my hands the psychotherapeutic goal in this area of disorder has been directed toward elimination of the patient's mental uneasiness or toward liberation from other barriers which hinder the satisfactory release of his drives. Therewith the patient's point of view—the effects of his temperament—which produced his physical dysfunction, also receive the indicated interpretation calculated toward modification of his mental attitude. Furthermore, achievement of the mastery of liberation of his emotions, which have heretofore been constantly and forcibly inhibited by the mind from seeking expression, also require channelling through psychotherapeutic guidance aimed at adequate patient recognition of his repressed obstacles, which, as unconsciously operating factors, have been hindered in their discharge.[2,15,16]

A 32 year old white male consulted me because he had been sufferer for some five years, from periodic phases of diarrhea and marked abdominal tenderness. This condition had become progressive both as to severity and frequency during these years. From the history I learned that he had previously consulted several gastroenterologists, and found that each of them had diagnosed the patient's condition as colitis. It was brought out during interview that the patient had completed his secondary schooling under trying circumstances. He usually kept to himself in his classes, was in dread fear of failing in his subjects, and did not engage in nor participate even to the slightest degree in competitive scholastic sports because of his harbored feelings of inferiority. I further gleaned from the patient that as he grew older he continued this isolated existence, mixed with difficulty, and worked in insulated surroundings in the shipping department of a clothing factory. He was in the habit of spending his leisure and week-ends reading novels, going to movies by himself, and taking long solo walks. He made numerous forced efforts based on self-compulsion, to acquire the socialization of male and female contacts, but in none of these was he successful in properly acquiring or retaining such associations. As to his diarrheal attacks, he particularly described exacerbations thereof whenever he would become exposed to new frustrating experiences, as when trying unsuccessfully to gain the friendship of others, or when some novel or trying situation arose at his work.

Throughout therapy he was encouraged to ventilate his experiences, and as his areas of blocking diminished, he was able to correlate and fixate his attending diarrheal discomforts. Eventually it became more apparent to him that his anxieties and fears engendered his intestinal upheavals; and further therapeutic sessions brought him to an understanding of the inception of his fears and the psychobiological significance of his colonic outbursts. As his dread of his personal deficiencies with their accompanying frustrations progressively lessened, his diarrheal bouts became reduced both in frequency and severity. After continuing in therapy for 3 years, the patient gradually began to find a need, which eventuated into positive feelings of satisfaction as and when he mingled with others. I saw him one year after therapy had been concluded at which time he advised me that his diarrheal attacks were but a memory; and that in addition to his liberal socialization with others he had acquired the friendship of a desirable female companion to whom he had successfully proposed marriage.

In certain individuals proneness to accidents is a personality function rather than determinative of any demonstrable extrinsic situation, and in a number of instances I have had occasion to observe patients with propensities to repetitive accident experience. This latter factor appears to be intrinsic in distinct patient groupings, with accidental injuries prevailing among a proportionately greater number of persons who, the more preoccupied they are with thoughts of bodily maiming, the more likely become their chances of getting involved in accidental injury—"traumatophilic diathesis."

These patients, who frequently reflect primary motivation, appear to symbolize an inclination to destroy. The latter tendency may be directed either toward themselves because of being guilt-laden, or may be demonstrative of the operations of antagonism directed at others as an indication of abhorrence of the latter.

In my investigative observations of these individuals, some of whom are brought before the criminal court charged with various offenses, as well as others within this clinical grouping seen elsewhere within hospital, clinic, and other settings, I have become particularly cognizant of the importance of careful recording and due regard respecting their antecedent histories.

It cannot be too emphatically stressed, that these patients most frequently reveal an im-

pulsive childhood tinctured with cantankerous behavior and recklessness—eventually even ranging to varying shades of delinquency as they grow up. In adulthood, patients within this grouping practically always demonstrate such psychogenic behavioral factors as dejection, agitation, impatience, anxiety, fearsomeness, or inordinate fatigue with coincidences of delayed muscular activity where spontaneity and coordination of action is called for. I have seen instances where, because of inability to adequately cope with workaday problems or situations as they may arise, such patients, with great emphasis, affix the causality of their ineptitudes and inefficiencies to their physical (accidental) injuries. Thus, by becoming the physical sufferer of unawarely determined accidents, the accident-prone patient combats guilt-ridden feelings through the unconscious provocation of persistent physical self-punishment—the price for hoped-for condonation for his masked culpabilities. For the show of full blown tension, imprudent behavior, erratic conduct, resentment to direction and/or contempt for correction, he, of necessity, reflects maladaptation both socially and in the economic field of activity. In addition, I have found that accident-prone patients, because of rejection of responsibility as related to gainful employment or advancement in the competitive sphere, are disposed to hang on to hospitalization or to treatment in whatever settings they may find themselves for as long as they can, and to lengthen the duration of their alleged distress from any physical hurts however sustained.

E.G. was a tall, powerfully built 16 year old male who was seen by me during one of his several encounters with the law. He had begun his career of delinquent behavior while in the 6th grade. He truanted, ran away from home, was sent to a correctional institution, paroled, returned to grade school, was judicially directed to have municipally provided psychotherapy, truanted again, and was apprehended for unlawfully driving an automobile which he did not own. As he was unable to pay the fine assessed by the magistrate, the youth asked for one week's grace to make the payment. He made no payment as promised, was again arrested and jailed. When released, he obtained another automobile, again drove it without a license, and was again arrested. While out on bail during the pendency of the hearing, he was re-arrested for continuing to drive without a license. This time the judge committed him to a mental hospital for observation. After 2 weeks he was found not to be psychotic, and was returned to the court for disposition. He was given a long term suspended sentence and judicially directed to obtain steady employment. In addition, his industrial activities were to receive continued weekly probational supervision for the duration of the suspended sentence.

The youth obtained work as an errand boy but after 2 days stumbled and twisted his ankle. He reported the swollen limb which was demonstrably ecchymotic. He obtained a menial job in a bookbindery when his foot had improved, and in less than a week he injured his thumb at the binding machine; and again became an industrial casualty. When the finger healed, he obtained another job as pin boy in a bowling alley. He worked there for one day and was struck in the face by a pin. When last seen he was "looking for a job, but it's hard to get a good one."

In order to extricate himself from the pressure of his sense of guilt, he recognized these feelings and paid them off in his accidents. Psychodynamically, his accident experiences significantly served to penalize him for his guilty deeds and at the same time served as expiatory compensation and as continued permissiveness to engage without conscious resistance in other or similar delinquencies.

Clarification of their disharmony with surroundings and proper awareness and recognition by these patients of their emotional sources and personality make-up is the psychotherapeutic criterion sought to be achieved. This, through redirection of their goals, inculcation of awareness into their conflicts and complexes and reorientation into a socially acceptable mode of living.[2,17,18,19]

General Considerations Respecting Psychobiologic Approach

Emotionally turbulent situations exert an important influence upon bodily functions and bear a direct relationship to the type, severity and frequency of their disordered performance. When confronted by apprehension, anxiety or other emotional flare-up, psychogenic manifestations, reflect a definite relationship to psychobiological disturbances attributable to vasomotor, respiratory, cardiological, gastrointestinal, and other variously demonstrated associated pathological phenomena. In my extended observations and examinations in the courts, veterans hospitals and installations, civilian hospitals,

psychosomatic clinic and in other and private settings, of patients with presenting bodily dysfunctions where, notwithstanding definitive physical diagnosis and appropriate objective treatment, improvement had been lacking—analysis of their symptoms has characteristically disclosed that they harbor in the latter, the effects of their character make-up as well as of their accumulated psychogenic disturbances. It is these psychobiological influences that mirror the symptoms upon which these patients concentrate; and I have frequently found it difficult if not impossible to convince some of them to believe or to accept as motivating cause, the coexistent emotional factors. I shall not overlook instances of observation of patients, who, because of their complete preoccupation with their conspicuous bodily ailments, rigidly deny as well as fail to recognize their engendered mental uneasiness therewith.

Discussion

Bodily responses to stimuli have complex limits of susceptibility. A most important standard is the direct introspective experience—the *psychological* criterion. Although anatomy and experimental physiology may differentiate structurally the conduction paths of sensation to organs on the anatomical basis, still the response varies characteristically for the different senses in the manner of the *physiological* criterion.

The nervous organization may be conventionally identified under 2 great subdivisions: (a) the *somatic* or exteroceptive group, which relates to the body in general and its relative connection with the external environment, and (b) the *visceral* or interoceptive group, which comprises innervation related to respiration, digestion, circulation, excretion, and reproduction. The latter group is closely associated with the sympathetic system and those parts of the central nervous system directly connected therewith.

The mechanisms by which the body is able to adjust its own activities in relationship to those of the outside world, are thus mediated by the cerebrospinal as distinguished from the sympathetic system. Although the organs belonging to each group perform much of their functions independently of the other, nevertheless the two groups are by no means independent, since external excitations may produce strong visceral reactions, and by the same token, strictly visceral or interoceptive apparatus, the thalamic and visceral mechanisms of affective experience, give organic background to the entire conscious existence. In the healthy individual these mechanisms may function with a minimum of cortical control. But in psychopathologic states there is complex cortical interaction which influences the fabric of the most important mechanisms centering about the physiological correlates of our higher affective life and its relationship to the conformation of human conduct.

As physicians, our duty to our patients presupposes not alone physiological medication and surgical techniques, but also an alertness to the proposition that psychobiological factors invariably complicate, and very frequently are entirely accountable for a presenting symptomatic picture.

As already represented, considerable physical and mental suffering and maladjustment, is, in many instances, predicated upon other than an organic foundation or symptoms, and much can be accomplished toward patients' welfare if we would put to practical use our latest information on the developments in psychology and psychopathology. It is through the latter that we may properly consider and acquire a realization of the true character of the biologic aspects of psychosomatic illness with which we may become professionally confronted.

The scope of this paper has been mainly to clarify the role played by the psychodynamic determinants, which are so frequently the underlying and/or correlative factors of the psychobiologic syndromic picture, to alert to a timely recognition of the psychosomatic states, and to point out the capacities which can ameliorate and/or remove physical and psychic distress through employment of opportune preventive therapy.

Summary

The psychosomatic correlation between organ pathology and psychogenic disturbances to the extent that the latter patterns of behavior may either initiate the symptoms in frequent instances, or worsen an organic condition already present, has been exam-

ined. Based upon the foregoing views presented, it is maintained that establishment of diagnosis must be founded upon both physiologic and psychobiologic criteria, and where coexistent, appropriate clinical management is incomplete unless it includes compatible psychotherapeutic regimen designed toward readjustment of the complicating psychic maladaptation whetever it exists.

Discreet psychiatric investigation of early environmental background, of attitude toward parents, siblings, and social relationships, of industrial aspirations, of measures of attainment, of marital adaptations, or of other specific life situations—mirrors the observable emotional reactions of patients exposed to divers psychic influences; and experientially I have found that well chosen therapy in the majority of possible instances decides the clinical result of the disorder.[2,10,13,14]

Some of the more commonplace psychologic conditions and their situational circumstances have been discoursed, their implications traced, and clinical approaches presented. As long as the psychic aspect of life exists, the interaction and interdependence of psychic and somatic phenomena must of necessity be a component of human existence. With equal emphasis may it be said that although bodily functions and emotional activities are mutually related, the determination as to which of the faculties are precisely chargeable with the initiation of the morbid process remains subject to individual variables as to whether the physiological factors as somatic, or the emotional as psychic, precede one another or occur simultaneously. Scientifically, and in the present state of our psychosomatic concepts, suffice it to say that medical supervision of psychobiological syndromes requires that twofold coordinate therapy—physiological and psychiatric—be carried out clinically. It is by this combined coordinate action in psychosomatic illness that both basic disturbing psychic elements as well as the somatic disorders can be simultaneously served and therapeutically approximated.

Man's constant urge to attain and retain efficiency, his unending requirement to herd and his ceaseless drive for approbation and preservation, are the elemental ingredients of human expression. It is toward preservation and/or restoration of these natural objectives of psychic and physical effectiveness that our faculties of symptom discernment and correlative therapeutic responslbilities must be integrated.

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211 EAST 35TH STREET

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The Electroencephalogram in Paralysis Agitans

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Introduction

A group of investigators[1] recently reported on the effects of pentothal on electroencephalograms in basal ganglia disease in a study dealing with sleep findings in 11 patients with Parkinsonism and chorea. Sleep was induced by intravenous sodium pentothal. It was reported that pentothal spindles were absent in the EEGs, which was interpreted as indicative of subcortical pathologic involvement but not of the thalamus since clinically the patients did not have any symptoms which could be attributed to a thalamic lesion. The slides showed the pentothal response in normals, and the absence of the pentothal response in basal ganglia disease. In the latter, the pentothal fast frequencies were absent, "silent periods" of no activity were present, and occasional spindles (sleep spindles?) appeared.

The present study was undertaken because of the need for further research along this line.

Method and Procedure

Because there is a certain amount of hazard in the induction of sleep by intravenous pentothal, especially in elderly people, sleep was induced in this manner in only a small number of patients. In order to more clearly determine whether the absence of spindles under pentothal previously reported by other investigators was a function of intravenous pentothal injection or a manifestation of the disease process being investigated, four of these patients were given chloral hydrate to induce sleep and at a later examination they were given sodium pentothal for sleep induction. The chloral hydrate was given orally in doses of 20-45 grains. The amount of sodium pentothal ranged from 11-30 cc of a 2½ per cent solution administered intravenously. In only one patient was there sufficient sodium pentothal given to diminish the electrical activity of the brain to a level of apparently electric silence as evidenced by periods of no recorded potentials.

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These EEGs as well as the records of all other patients in our files with a diagnosis of Parkinsonism were classified according to the Gibbs system[2] and subdivided on the basis of etiology. This yielded 29 cases; 12 were believed to be due to arteriosclerosis, 12 to encephalitis, and five were considered idiopathic.

Results

There was no significant difference in the sleep activity obtained in the recording of those four patients who received both chloral hydrate and intravenous sodium pentothal other than the initial pentothal spindles induced by the latter drug before the stage of normal sleep spindles was reached. (Fig. 1).

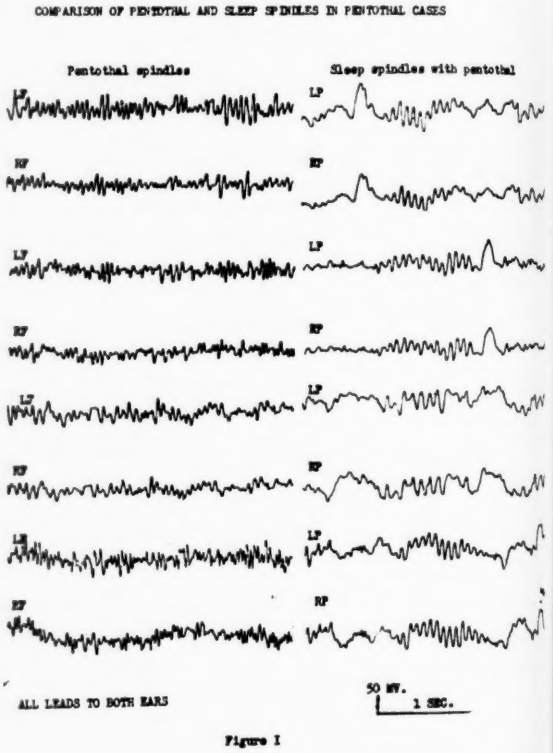

Figure 1

In these four patients there were sleep spindles with chloral hydrate and with intravenous sodium pentothal. Furthermore, one of the patients had spindles in natural sleep. This appears to be fairly convincing evidence that the method of inducing sleep as used in the present experiment does not significantly alter the character of the sleep spin-

dles. Five other patients had sleep spindles produced by chloral hydrate. (Fig. 2.)

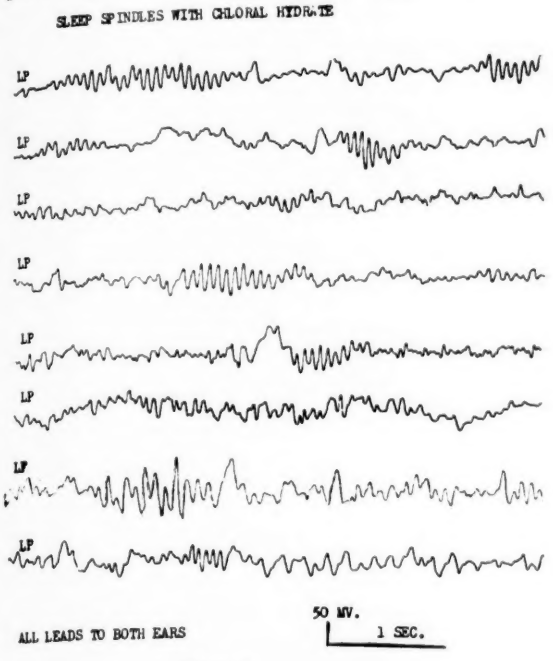

Figure 2

The sleep tracings were also searched for the "mitten pattern" reported by Leemhuis and Stamps[3] to be more common in Parkinsonism than in any other condition. This "mitten pattern" consists of a slow spike and wave appearing in the frontal regions during sleep. Four of five patients in the arteriosclerotic group had this pattern in their sleep recordings, but it did not appear in the sleep recordings of four patients in the postencephalitic group. (Fig. 3.)

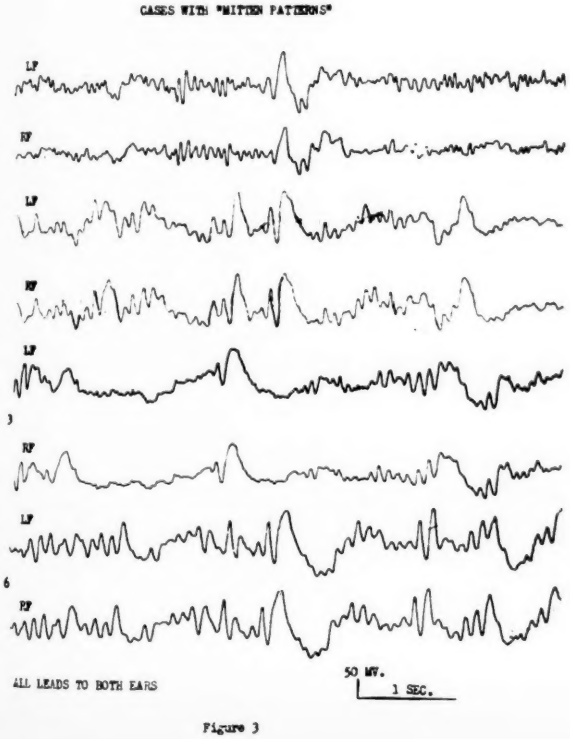

Figure 3

In the arteriosclerotic group, eight of 12 patients had abnormal EEGs with six classified as slightly abnormal-slow (S-1), one classified as very abnormal-slow (S-2), and one with an amplitude asymmetry (reduced voltage) in the right occipital area. Nine of 12 patients in the postencephalitic group had abnormal EEGs, eight being classified as S-1 and one as asymmetrical. Only one of five in the idiopathic group had an abnormal EEG, and it was classified as S-1. When the results are combined, 18 of 29 have abnormal EEGs and these are almost invariably classified as S-1 records.

Discussion

There is evidence in the literature to indicate that neuropathological findings are almost invariably found in arteriosclerotic Parkinsonism and chorea patients who come to autopsy. Alexander[4] reported that in 18 such cases there was diffuse involvement of the central nervous system including the striatum and thalamus. In a group of 19 cases of postencephalitic and idiopathic Parkinsonism there was only one case with thalamic involvement. The group of 11 patients studied by Mallin et al.,[1] was said to have had severe basal ganglia involvement, but the etiology of their cases was not stated.

There is evidence[5] to indicate that sleep spindles may originate in the thalamus; and it is also to be noted that 8-12 per second spindles do not appear in chronic decorticate cats, in which autopsy shows degeneration of thalamic nuclei, especially centralis, medialis and lateralis. Ingram and his co-workers[6] have reported depression of sleep spindles in the EEGs ipsilateral to the unilateral lesions placed in the thalamic nuclei of cats. Cress and Gibbs[7] have also demonstrated a reduction of sleep spindles in patients with vascular and traumatic hemiplegia. Lennox and Collidge[8] report the presence of sleep spindles induced by sodium pentothal in 48 patients who were later subjected to prefrontal lobotomy. There was virtually a

complete absence of sleep spindles anteriorly in the post-lobotomized EEG records. They report that in those cases where sleep spindles were obtained in the anterior leads following surgery, severance of the fiber tracts between the cortex and thalamus was assumed to be incomplete.

Freeman[9] has reported that the nucleus medialis shows the most marked degeneration after lobotomy. Lennox and Coolidge consider the above data as evidence that this thalamic nucleus is the site of origin of sleep spindles. More recently Merlis[10] and his coworkers reported ipsilateral reduction in sleep spindles of a case of thalamic syndrome of the Dejerine-Roussy type.

Brazier and Finesinger[11] have reported that electroencephalographic changes during intravenous injection of sodium pentothal are dependent on the dose and rate of injection. Slow injection is accompanied by marked increase in fast activity, consciousness is regained quickly when the needle is withdrawn, and no sleep spindles appear. Faster injection of larger amounts produces immediate deep sleep activity with little or no preceding fast activity. Characteristically, the pattern of waking cortical activity through the various stages of pentothal induced sleep appear as shown in Figure 4.

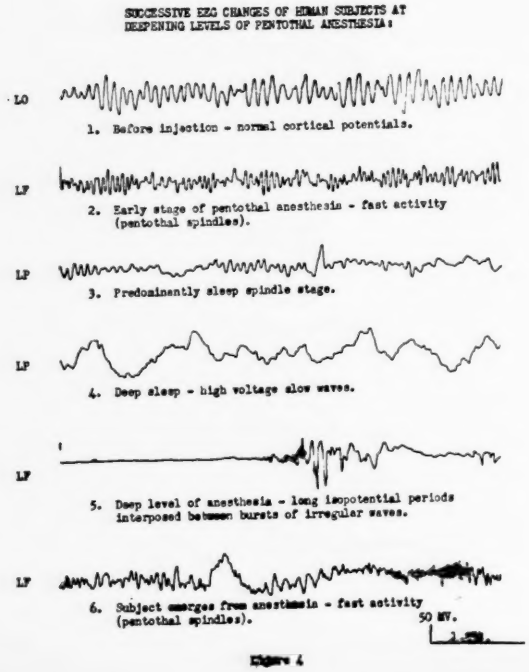
SUCCESSIVE EEG CHANGES OF HUMAN SUBJECTS AT DEEPENING LEVELS OF PENTOTHAL ANESTHESIA:
LO
1. Before injection - normal cortical potentials.
LF
2. Early stage of pentothal anesthesia - fast activity (pentothal spindles).
LF
3. Predominantly sleep spindle stage.
LF
4. Deep sleep - high voltage slow waves.
LF
5. Deep level of anesthesia - long isopotential periods interposed between bursts of irregular waves.
LF
6. Subject emerges from anesthesia - fast activity (pentothal spindles).
50 MV.

Figure 4

Another factor that might be considered is the age of the patients. Spindles are less evident in aged persons than they are in the young and middle-aged persons.[12]

If the EEG tracings showing no sleep spindles were taken in light sleep, as found in Mallin's study, then there should be the type of activity described above in stage two. This was not apparent as viewed in the slides which were shown by these investigators. In the series of slides presented by them, there appeared the type of sleep activity shown in stage five. It is likely that the patients received fast injections of the sodium pentothal with resulting deep sleep where sleep spindles are not expected to occur.

Summary and Conclusions

The foregoing findings and discussion indicate a lack of correspondence between the results of the present study and that of Mallin's group.[1] The discrepancies might be explained by one or more of the following:

1. Differences in the technique of inducing sleep which affect the pattern of the brain waves.
2. Difference in age.
3. Possibly greater thalamic damage in the group studied by Mallin et al.

The first is, in our opinion, the most important.

In regard to the "mitten pattern" in Parkinsonism, four of our nine cases with sleep tracings did show this type of activity. These cases were in the arteriosclerotic group. This "mitten" phenomenon is not seen often in routine sleep records, but no adequate statistics are available to indicate that this finding is significant. Of 29 cases with Parkinsonism, 62 per cent showed abnormal EEGs, usually of the slightly abnormal-slow (S-1) type.

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The Pneumoencephalogram in Patients With A Convulsive Disorder

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In the process of reviewing the pneumoencephalograms done over a period of five years at a university hospital, it was noted that a large number of the patients had a history of a convulsive disorder. This group was made up of infants, children and adults for whom there were varied etiological agents for their convulsive state. Since these patients had a thorough neurological examination including a pneumoencephalogram I felt that a survey of this group would be of interest.

In this series there were 355 patients with a convulsive disorder out of a total of 510 cases studied. This represents 69.6 per cent of the total cases surveyed. For convenience in handling and to enable a more detailed examination of the group with a convulsive disorder, I have broken them down into the following etiologic categories: 1) Post-infectious; 2) Neoplastic; 3) Post-traumatic; 4) Idiopathic.

Post-infectious Convulsive Disorder

Seventeen patients were thought to have their seizures on a post-infectious basis. Eight had focal seizures and nine had the generalized type. The following chart shows the encephalographic findings in these cases.

FOCAL SEIZURES—8

Encephalographic Findings:

NORMAL	2
ABNORMAL:	
General dilatation	3
Local dilatation	1
Subarachnoid channels asymmetrical	1
FAILURE	1

GENERALIZED—9

Encephalographic Findings:

NORMAL	3
ABNORMAL:	
General dilatation	2
Local dilatation	3
Subarachnoid channels asymmetrical	0
FAILURE	1

Tumor as Cause of a Convulsive Disorder

A tumor was the causative agent in 30 of the patients with seizures; 23 of these had focal type spells and the other seven were of the generalized type. Ten of this total had their space-occupying lesion removed previous to the air study. Three more had a question of a tumor. Thus 20 were discovered by the encephalogram done in this reported series. The following chart is a break-down of this group.

TUMORS

TUMOR	Focal	Generalized	ENCEPHALOGRAPHIC FINDINGS: Normal	Abnormal: Shift of ventricles	Abnormal: Ventricular dilatation	Failure	Interval between onset of seizures and finding of lesion
1. Meningioma	x				x		2 years
2. Glioma	x					x	2½ years
3. Astrocytoma	x			x			2 years
4. Angioma	x		x				10 years
5. Astrocytoma	x			x			4 years
6. Angioma	x				x		5 years
7. Meningioma	x				x		1 month
8. Meningioma	x				x		5 years
9. Oligodendroglioma	x					x	3 years
10. Meningioma	x			x			6–8 months
11. Glioma	x			x			9 months
12. Hemangioma	x				x		months
13. Meningioma	x				x		months
14. Meningioma	x				x		5 years
15. Oligodendroglioma	x			x			10 months
16. Astrocytoma	x			x			7 years
17. Astrocytoma	x			x			19 months
18. A. V. Angiomata	x			x			3 years
19. Glioblastoma	x		x				1½–2 years
20. Glioblastoma	x			x			7 months
21. Right thalamic	x					x	weeks
22. Meningioma	x			x			2 years
23. Astrocytoma	x		x				2 years
24. Astroblastoma		x			x		Unknown
25. Astrocytoma		x		x			3–4 years
26. Meningioma		x				x	18 years
27. Ganglioneuroma		x			x		16 years
28. Glioma		x				x	1 year
29. Papilloma		x			x		Post-op
30. Meningioma		x			x		7 years
TOTALS	23	7	3	11	11	5	

Tumors 1, 6, 7, 12, 13, 14, 24, 28, 29, 30 removed previous to 1944. Three other patients had a question of a tumor.

Post-traumatic Convulsive Disorder

There were 94 patients in whom a history of head trauma was substantiated and was the causative agent. The following chart is a detailed analysis of these cases.

POST-TRAUMATIC SEIZURES

FOCAL

TRAUMA:				
OPEN:				
Operation	8	–	–	—
None	–	0	–	—
CLOSED:				
Operation	–	–	4	—
None	–	–	–	18
ENCEPHALOGRAPHIC FINDINGS:				
NORMAL	2	–	0	5
ABNORMAL:				
General dilatation	3	–	2	9
Local dilatation	3	–	1	0
Subarachnoid channel asymmetry	0	–	1	0
FAILURE	0	–	0	4

GENERALIZED

TRAUMA:				
OPEN:				
Operation	14	–	–	–
None	–	0	–	–
CLOSED:				
Operation	–	–	6	–
None	–	–	–	44
ENCEPHALOGRAPHIC FINDINGS:				
NORMAL	3	–	1	20
ABNORMAL:				
General dilatation	4	–	2	10
Local dilatation	6	–	3	4
Subarachnoid channel asymmetry	0	–	0	3
FAILURE	1	–	0	7

Idiopathic Convulsive Disorder

The largest group of cases was placed in the idiopathic classification for lack of indication that one of the three previous etiologies was significant. The following chart is an analysis of this group.

	Seizure	
	Focal	*Generalized*
TOTAL NUMBER	66	145
ENCEPHALOGRAPHIC FINDINGS:		
NORMAL	31	66
ABNORMAL:		
General dilatation	10	37*
Local dilatation	9	10
Subarachnoid channels asymmetrical	5	6
FAILURES	11	26

*Contains an agenesis of the corpus callosum and one with absent septum pellucidum.

Thus the 355 patients with convulsive seizures as part of their history and/or complaint fell in the following distribution according to the etiology found from the history, encephalographic interpretation, or actual operative observation:

Post-infectious	17	(4.8%)
Post-traumatic	94	(26.5%)
Tumor	30	(8.5%)
Idiopathic	211	(59.4%)
Question of a tumor	3	(0.85%)

Pancoost[1] made the statement in 1930 that 80 per cent of the "Idiopathic" cases of convulsive disorders show gross abnormal changes on the encephalogram. Pendergrass[2] goes even further and states that all cases of convulsive states studied by him have shown some form of atrophy of the brain. In a series of 27 patients with seizures of unknown origin studied by Stone[3] (1933), 10 had positive x-ray findings and 17 were normal. A group of post-traumatic convulsive disorders revealed 12 with abnormal encephalograms and 13 were considered normal. Fay,[4] in his discussion of a paper on encephalography by Pancoost, states that 5 per cent of the so-called idiopathic epilepsy had brain tumors and 20 per cent have a neurosurgical lesion which is amenable to treatment. A recent report by Casamajor[5] (1949), in which he studied 500 pneumoencephalograms in children, stated that this procedure had little to offer in the diagnosis or indication of treatment in most cases of epilepsy. Of these children 250 had a convulsive state. In those classified as Jacksonian type, 92 per cent had a normal encephalogram and 8 per cent revealed abnormal findings. Those with generalized seizures revealed 45 per cent with normal air studies and 55 per cent were reported as abnormal. There were brain tumors in this group.

New data on the occurrence of a convulsive disorder after head trauma has been accumulated since World War II. Ascroft[6] (1941) reported that even when the dura was not torn 23 per cent of these injuries were followed by chronic seizures. This incidence is only half as high as when the dura was penetrated. If the dura was torn and the cortex lacerated and fragments of bone driven into the tissue, the rate of chronic epilepsy is about 45 per cent.

The incidence of brain tumor as a cause of a convulsive state was next to last in this series of cases. Many children were included in this group of air studies and since the majority of brain neoplasms are infratentorial in this younger group, it might well explain our findings. Also the patients were thoroughly screened to exclude the presence of a neoplasm before the air study was carried out. Grotten (1931)[7] found 3 brain tumors in 56 encephalographic procedures in epileptics. This comes to 5.3 per cent of the total. Of 1130 patients admitted to the Massachusetts General Hospital with all varieties of epilepsy from 1935 to 1944, 240 had seizures arising from an area that could be localized by the various means we employ today. White[8,9] divided the series into two groups: 160 cases of cerebral compression caused by intracranial tumors and 80 cases due to trauma or infection. This comprised 21 per cent of the total admissions for epilepsy. Parker[10] (1931) reported that 67 (21.6 per cent) of 313 brain tumor cases had seizures. Sargent[11] found 30 per cent of his 270 tumor cases had seizures. Dowman and Smith[12] reported 19 per cent; Dana[13] found seizures in one-fourth of patients with cerebral neoplasms and McRoberts and Teiner[14] gave the smallest figure of 2.4 per cent (4) in 165 cases.

There were 29 or 8.5 per cent (10 removed previous to the reported air study) of patients with spells who had brain tumors in this series. Three more had a question of a tumor. Out of the remaining 155 patients without a history of seizures, there were 17 (10.9 per cent) tumors. Five more had a question of a tumor and 3 were removed pre-

vious to this study. One patient with a papilloma had convulsions which did not begin until after the operation for removal of the tumor and is not counted in the figure of 29 tumors.

Summary

1) The results of the encephalograms done on 355 patients with a convulsive disorder is reported.

2) Of the 17 patients placed in the post-infectious category, 10 had abnormal encephalograms. The abnormality was found equally among those with focal seizures and those with generalized seizures.

3) Intracranial tumors was proven in 30 of the group. Three of this number had a normal air study. One was later proven to have an angioma and the other 2 were gliomas.

4) Post-traumatic cases made up 94 of the total patients studied. Almost one-half of those with generalized seizures following a closed head injury had a normal appearing air study. While less than one-third of those with focal seizures following a closed head injury presented a normal appearing encephalogram.

5) Over one-half (211) of this series were placed in the idiopathic category. The encephalogram was interpreted as being normal in about one-half of this number of patients.

6) From the above findings it can be seen that the pneumoencephalogram throws little light on the cerebral pathology in a large number of patients with a convulsive state. Its place seems secure in helping to establish the presence or absence of cerebral neoplasm.

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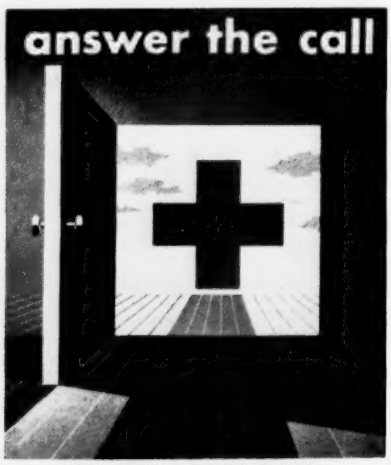

1954 RED CROSS FUND

Analeptic Action of Oral Metrazol in Geriatric Practice

(A Preliminary Report)

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The practical elimination of severe epidemics, at least in civilized countries, the effective therapy of infections by the sulpha drugs and antibiotics, the use of insulin and progress in surgery are some of the advances of modern medicine which have measurably increased the span of human life. In return, however, they have left us with an increasing number of individuals subject to the physical and mental infirmities incident to old age.

This aging and aged population must be taken care of. Medical science in prolonging life also has the duty of making the added years as pleasant as is possible with the limited capacity for living of these old people.

"We physicians must make it known that the aging and the aged we are keeping alive are not wrecks, incapable of carrying at least a part of the burden of their support." (Allen.)

As Smigel points out, we must evaluate both the faculties which the senile patient has left and those he has lost. We must also on the basis of our findings attempt to stimulate such capacities as are still present or attempt to make the remaining capacities replace those lost. We must not refuse to expend our efforts at improving the status of these patients because complete rehabilitation seems impossible.

May we stress that even if no more is achieved than to make such a patient less resistive, less destructive, and more amenable to treatment and ward discipline at an institution, much will have been achieved because then more time and care can be given to these patients who are dependent on the help of others. If it is possible to produce sufficient improvement to allow of home care, a very great advantage, indeed, will have been achieved since adequate institutional facilities to properly care for all the geriatric patients will probably never be available. The number of the aged is constantly increasing but even today state institutions and asylums are overcrowded and proper efforts at rehabilitation on a larger scale are physically impossible.

Of all the methods of improving the conditions of geriatric patients the simplest is that of stimulating those faculties which still remain and good results in this direction have been reported by Chesrow et al., Fong, Swenson and Grimes, and others by means of regulated oral Metrazol therapy.

Metrazol is an analeptic which acts principally on the medullary centers when these are depressed but also stimulates the whole cerebrospinal axis to some extent. (Goodman and Gilman.) The stimulation of the respiratory center will help overcome anoxia and raise cerebral metabolism while the general tonic effect of the drug on skeletal muscle and nerve impulse transmission (Bøje, Chance, Dripps and Larrabee) may alert the patient unless irreversible brain changes are present.

In the Spring of 1952, thirty-nine men were selected at random from the male senile wards of the San Antonio State Hospital for a trial treatment with oral Metrazol over a 90 day period. In 35, or 90% of these patients signs of cerebral arteriosclerosis were present, four showed senile mental changes, one was psychoneurotic, and one was diagnosed Wilson's disease because of the presence of signs of progressive lenticular degeneration. The men selected constituted a fairly representative cross-section of our male geriatric patients.

The dosage was regulated empirically. All patients were started on 1 tablet four times a day for one week when the dose was increased to 2 tablets four times a day. Where increasing improvement was noted on this quantity, the dosage was maintained at that level. Where improvement became static, or where there was no improvement, a dosage of 3 tablets four times a day was instituted. Those that showed benefit on 3 tablets four times a day (about one-half of the patients), were reduced to 2 tablets four

From San Antonio State Hospital.

times a day. If improvement was maintained, this dosage was fixed. If the patient relapsed a return to 3 tablets was made. If no improvement was achieved with 3 tablets four times a day, the dosage was reduced to 2 tablets four times a day and continued for 3 full months.

After about a month of treatment the supply of Metrazol was temporarily exhausted for 2 weeks and within this time a deterioration was noticed in all patients who had shown improvement. However, the patients again improved when the administration of Metrazol was resumed. The treatment was continued for a total of 90 days. It seems now, however, that this was needless, for our experience has been that if no improvement occurred in the first four weeks, none could be expected later.

There were no general undesirable results attributable to the medication. One or 2 patients suffered from nausea during the Metrazol therapy, and a few complained of initial nausea which subsided although medication was continued. It appeared that almost all patients showed a transient elevation of blood pressure of approximately 5 mm. of Hg, especially diastolic, in the early phase of the treatment, but none maintained this increase.

Of the 39 cases, 9 were unimproved by the medication in any dosage. Thirty cases seemed improved by the drug. Of these, 19 showed only moderate improvement which was manifested by greater cooperation, less irritability or depression. However, the betterment in 7 of these men was sufficiently marked so that they could be transferred to the Kerrville Geriatric Home.

Eleven patients showed marked and surprising improvement. This was evidenced in varying degree by increased alertness, interest in ward activities, restoration of normal interest in personal neatness, and in family affairs and activities outside the hospital. Since the start of the Metrazol therapy, 12 patients improved so greatly that they returned to their families and medication continued by their private physicians. Only one of these men had to be returned to our institution.

A tabulation of results indicates the following: Of the 30 cases improved, all showed increased alertness; 15 had increased appetites; 12 showed more interest in personal appearance; five were more cooperative. One deaf patient appears considerably better. One untidy and destructive patient was able to go home. Another who was destructive, denudative and refused to eat, improved enough to go home. Another mute and uncooperative patient now helps with the ward work and talks more sensibly. One, diagnosed as Wilson's disease, does not soil himself at present, is more alert, usually walks considerably better, is more interested in events outside the hospital, and no longer insists on a daily shower with his clothes on.

Comments and Conclusions: Of the 39 senile patients on whom Metrazol was tried, 30 or 77% were improved. Of these, 11 or 28% were markedly improved while 19 or 49% showed minor improvement. However, even of these cases 7 or 18% were so much improved that they could be transferred to a home for the aged. The other 9 or 23% showed no change in their status.

As a result of our experience all patients admitted to our male geriatric building are now routinely given one week's adjustment period, and then started on Metrazol in increasing dosages until 3 tablets four times a day are given. If no result is obtained at the expiration of 30 days, the patient offers little chance of improvement and the drug is discontinued.

From the described cases we feel that Metrazol has a definite place in the therapy of geriatric and psychiatric cases and should be prescribed for all patients admitted to the geriatric service in the described dosage for at least four weeks. If possible, the drug should be given early to arteriosclerotic and senile patients in an attempt to prevent, or at least delay the onset of a psychosis or a mental confusion necessitating hospitalization.

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Carbon Dioxide Therapy With Stutterers

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Introduction

The treatment of stutterers by means of inhalation of carbon dioxide has been reported by Meduna.[2] Patients inhaled a mixture of 30% carbon dioxide and 70% oxygen three times a week for 30-110 treatments. According to his particular method of evaluating improvement 14 of 33 stutterers treated showed marked improvement. Of these patients 11 were rated as "100% improvement," or cured. The 14 patients rated as "marked improvement" had an average of 70 treatments. Only 12 patients failed to show any improvement. The only other report of carbon dioxide treatment of stutterers is by Weaver, et al.[5] who treated two cases, neither showing definite improvement.

Since stuttering is remarkably resistant to the usual forms of psychiatric treatment, the use of carbon dioxide therapy appeared promising and worthy of further investigation. The procedures employed by Meduna were observed by the authors in an attempt to reproduce his conditions of treatment as far as possible.

Meduna[2] in describing the method and results of his treatment insists that every precaution was taken to minimize the role of suggestion. For instance he employed a standard form for introducing the patient to treatment that did not offer the patient any promise of improvement. Observation, however, led us to believe that elements of suggestion nevertheless might be present. A general solicitous attitude on the part of the clinician was observed which might well have constituted an important therapeutic force.

Finally it was observed that the method of evaluating improvement in the speech of stutterers was dependent on the impression of a speech correctionist as to changes in fluency and attitude and on the recorded impressions of the patients and their friends and relatives.[4] Standardized measures of changes in speech and attitude towards speaking were lacking.

Procedure

Because of the success claimed it was decided to repeat the treatment procedure, but with certain modifications that seemed appropriate for a critical test of carbon dioxide therapy in stutterers.

It was decided to employ control subjects matched with experimental subjects for age, sex, and severity of stuttering. The experimental subjects received nitrous oxide up to the point of light anesthesia at which point CO_2 was administered and loss of consciousness maintained. This was in accordance with Meduna's procedure[3] and characteristically 20-40 inhalations were required. The control subjects were given nitrous oxide to the point of light anesthesia and were then allowed to recover. Two psychiatrists al-

This research is from the Department of Psychiatry, University of Toronto. It was supported financially by the Federal Mental Health Grant of the Government of Canada.

ternated in the administration of gases to the patients.

Both control and experimental subjects were introduced to treatment by the same preliminaries. They were not told what gases they would be given, but were told what the general nature of treatment would be. They were offered no assurance of improvement but were told that the treatment was experimental in character. Subjects were not aware that there were 'control' patients among them throughout the experiment.

Before being accepted as a control or experimental subject, the stutterers were investigated medically, psychologically, and from the standpoint of speech. Electrocardiographic and electroencephalographic studies were carried out to eliminate those physically unsuitable for treatment.

In order to trace in detail the course of clinical improvement, sound recordings were made of the oral reading of our subjects after every six administrations of carbon dioxide, and every two weeks for two months following treatment. After every administration subjects were asked to record their impressions of treatment and make any comments. After every ten treatments a battery of tests purported to measure handedness was administered.

Before beginning treatment, our subjects were given the Iowa Scale of Attitude towards speech[1] and the Rorschach test. These tests were repeated after treatment had been discontinued. Before and at three month intervals during treatment and twice following treatment the subjects were interviewed by a speech pathologist who appraised their progress and rated the severity of their stuttering on a ten point scale. Finally questionnaires relating to speech were requested of the relatives and friends of our patients. From the extensive data that was collected only the results from the analysis of sound recordings of the oral reading tests, the ratings of stuttering severity, and the self-evaluations of the patients following treatment, will be given in this report.

Results

Frequency of Stuttering

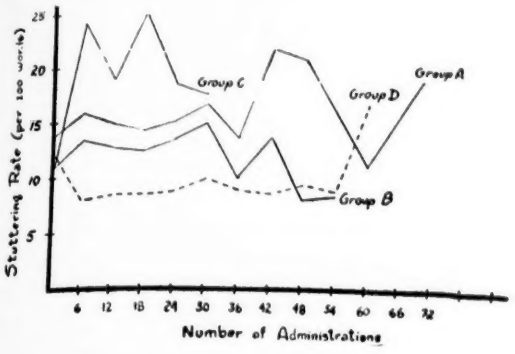
Sixteen experimental subjects were given carbon dioxide therapy under the described conditions. Two of these have been eliminated from analysis here because their treatment was interrupted by absences of more than a week. For the purpose of analysis three groups were recognized according to the number of treatments received. Group A consisting of three men and one woman, received 70 CO_2 administrations. Group B, consisting of four men and women, received between 48 and 54 treatments. Group C, consisting of two men, received only 30 administrations of CO_2.

Before therapy, and at intervals of six treatments our subjects were asked to read aloud different passages of prose. These readings were recorded and later analyzed for the frequency of stuttering. The results are given for the three groups in Figure 1. Group A received the largest number of treatments but showed at the end of treatment a considerably higher stuttering frequency than before. Following the curve for Group A it is evident that although at certain points a slightly lower rate of stuttering is manifest than the initial rate, there is no sustained tendency toward lower rates of stuttering. Group B shows a similar curve to Group A with less deviation from the initial rate but does not show substantial change. The two individuals constituting Group C showed markedly increased rates of stuttering in all tests following the initial test. It is known that in the case of one of these patients this upsurge in rate of stuttering accounted for his withdrawal from treatment after thirty administrations.

Contrary to the plans of the experiment only six control subjects were employed. The rationale underlying the use of control subjects was that they would provide a baseline from which the anticipated clinical improvement in our experimental subjects could be measured. The fact that this anticipated improvement did not occur rendered this element in design rather meaningless.

The six control subjects each received between 30 and 45 administrations of nitrous oxide. The frequency of stuttering for these six cases throughout treatment and for a few following intervals is given by Group D in Figure 1. A slight decline in rate of stut-

tering may be noted that was maintained until several weeks after termination of treatment when a sudden increase in frequency was observed.



Severity of Stuttering

The ratings of stuttering severity made by the speech pathologist were employed to measure changes in the duration of the stuttering spasm, the amount of struggle associated with spasm, etc. During treatment and following treatment these ratings remained the same for the whole experimental group. The ratings of stuttering severity on the control group were the same following treatment as the initial ratings with the exception of one case where a definite increase in severity was observed.

Self-evaluations

Considering the experimental subjects opinion as to their condition two months after the termination of treatment, none expressed unqualified feelings of having benefitted. One subject felt that she had improved generally to some extent. This subject showed an objective decline in stuttering frequency from 29 per cent initially, to 18.4 per cent after fifty treatments. However, she was still by all standards, a seriously handicapped stutterer.

Two months after the completion of treatment the subjects were asked to answer a series of questions. The results of four questions from this series are presented in tabular form in Table 1. It may be seen that as a group the experimental subjects did not feel that treatment reduced their frequency of stuttering. The testimony of the four who felt their stuttering increased is supported by objective findings. The experimental subjects did not feel that their use of tricks or devices to minimize or hide stuttering was affected. Four stutterers, however, felt that they were more willing to speak and five claimed to feel less fearful in speaking situations.

Although these results suggest some improvement in anxiety relating to speech in the experimental subjects it should be noted that comparable responses are given by our five control subjects. Three of the five state they are more willing to speak and three say that they have less fear in speaking. The control subjects note no change in their use of stuttering devices and only two report a decline in stuttering frequency.

QUESTION	RESPONSE			
	Increased	No Change	Decreased	
Do you feel your frequency of stuttering has changed?	4	7	2	Experimental
	0	3	2	Control
Has your use of devices to cover-up stuttering changed?	0	11	2	Experimental
	1	4	0	Control
Has your fear of speaking changed?	2	6	5	Experimental
	0	2	3	Control
Has your willingness to speak changed?	2	7	4	Experimental
	3	2	0	Control

TABLE 1. Self-evaluative response of 13 experimental subjects and 5 control subjects two months after treatment.

Discussion

Meduna reporting on changes in fluency of stutterers treated with CO_2 says, "The fluency of speech, the indicator of improvement, shows, during the treatment, successive periods of improvement and relapse." (2:80.) Commenting on the general trend of these changes he states, ". . . the fluency of speech at no time dropped to the pre-treatment level." (2:80.)

It is evident from the foregoing that the results obtained in the present study are in sharp contrast. Measures of stuttering frequency did show rather marked fluctuation but no general tendency towards reduced rates of stuttering was observed.

The ratings of stuttering severity employed did not indicate any change in stut-

tering with CO_2 treatment. The self-evaluations of the patients following treatment support the objective findings relating to frequency and severity. It is only in respect to anxiety surrounding speech that a number of stutterers report improvement. It would appear that CO_2 therapy has no beneficial effect on the severity or frequency of stuttered speech. The decrements in anxiety relating to stuttered speech were reported by the control group as well as those on CO_2 therapy and were likely therefore due to other factors than the type of gas used.

There remains the matter of attempting some reconciliation of the findings in the present study with the results reported by Meduna.[2] It is possible that our selection of experimental subjects was such that those who would have been successful were not included. Comparing the age characteristics of our sample (21-36) with Meduna's[2] we find that both consist of young adult stutterers and do not include children, adolescents, or older adults. Regarding the age of onset of stuttering a difference may be noted. The age of onset was from 3-7 years of age for all experimental subjects. Meduna reports that while most of his stutterers showed an onset of stuttering before the age of seven, two subjects who showed 100% improvement began stuttering around puberty.

While differences of sample cannot be ruled out in accounting for the varying results obtained, it is felt that differences in method of treatment are probably of major importance. In the present study, strenuous efforts were made to eliminate factors making for a close doctor-patient relationship. Not only were our subjects denied assurances of improvement but were prevented from learning the exact nature of their treatment. If the results obtained by Meduna were purely attributable to the physiological effect of carbon dioxide on brain tissue (2:37) then one would expect comparable results even under the modified treatment program adopted in this study. One is forced to conclude that the nature of the therapeutic relationship between therapist and stutterer may be of considerable importance in accounting for the improvement experienced with carbon dioxide therapy.

Summary

Fourteen stutterers were treated with carbon dioxide inhalation therapy for treatment periods of 30 to 70 administrations. Objective measures of stuttering frequency and expert ratings of stuttering severity failed to indicate any improvement in stuttering. The evaluation of improvement by the patients themselves two months after treatment showed none felt improvement in stuttering frequency or reduction in the use of stuttering devices. Some indication of a decrease in speech-anxiety was reported by the patients.

Failure to obtain comparable rates of improvement to those obtained by another investigator was considered and an explanation offered in terms of the thorough exclusion of suggestion in the method of carbon dioxide therapy employed in their study.

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Figure 1.

Changes in the frequency of stuttering with CO_2 therapy:

Group A (N=4) 70 Administrations CO_2.
Group B (N=8) 48-54 Administrations CO_2.
Group C (N=2) 30 Administrations CO_2.
Group D (N=6) Controls 30-45 Administrations N_2O.